



Received: 10.07.2021

DOI: 10.15584/jetacomps.2021.2.13

Accepted for printing: 7.10.2021

Published: 28.12.2021

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## Necessity of Education Contents Change for Society Development

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### Abstract

The article urges the requirement of education content change by demands of society. Vehicles that serve for persons and goods transportation have relevant economic and ecological consequences in terms of the newest knowledge application. The production and exploitation of vehicles are affected by the level of education. For example, a gear-box has made a complex change of concept from uniform engineering product to product with multi branch character that consist parts of machinery, electric, information technology, including sensors, etc. Relevant changes will occur presumably in terms of new driving systems application.

**Keywords:** gear-box, electronics, automation, quality of education

### Introduction

At present, an automatic gear-box is gradually standard in vehicles. A gear-box with the highest effectiveness of driving power transmission is necessary, considering the amount of vehicles needed for persons and goods transport. The purpose of it is particularly ecology in terms of the lowest fuel consumption. Generality of drivers are amateurs that do not use a vehicle in the most effective and rational regime. This state can be solved by using an automatic gear-box that was designed by a number of highly qualified persons with the aim of optimal motion in terms of economy and ecology (the lowest fuel consumption). Standard gear-box is inadequate, because it is controlled mostly by non-specialists.

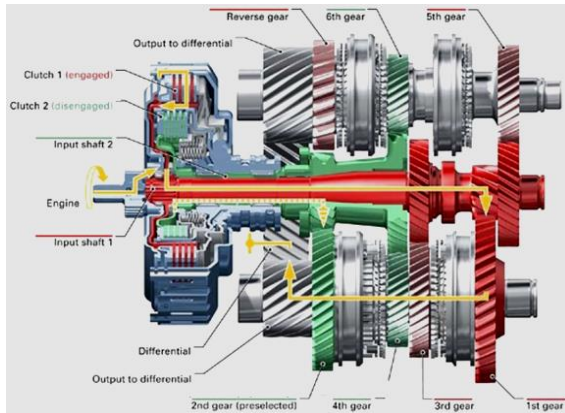
Vehicles are moving in different conditions, there is a requirement to choose from many driving regimes that enable: higher effectiveness, quality of driving,

riding comfort, lower volume of emission, etc. An electronic control of an automatic gear-box is a process based on continuous communication about operative conditions among sensors and a control unit of a gear-box. A control unit receives information about actual conditions and sets up electromagnetic valves that control the gear-box. Vehicle movement is characterized by its velocity and actuating resistances. Instantaneous power of the engine is determined by including all resistances (not only in gear-box). Basic function of the control unit of a gear-box is to select the optimal operating point from the whole characteristic of the engine in terms of economy and ecology (necessity of engine and automatic gear-box cooperation). Such a speed stage should be selected so that the engine behaves the most effectively. Electronic control system of automatic gear-box has to process numbers of input information, evaluate it, and output is one output information – inserted speed gear (if step wave gear-box is used).

Numbers of algorithms are saved into the control unit of the automatic gear-box. Algorithms evaluate actual situation by data from sensors (as for example: accelerator position, vehicle speed, revolutions of engine, revolutions of gear-box, acceleration, deceleration, temperatures and pressures into different points of vehicle systems, selected regime of gear control lever, etc.). Sensors transform physical values to electric signals – into a form suitable for electronic control boxes. In addition, there is the possibility to evaluate the style of a driver driving by electronic control unit using and consequently to select the optimal algorithm for automatic gear-box control.

### **Automatic gear-box DSG**

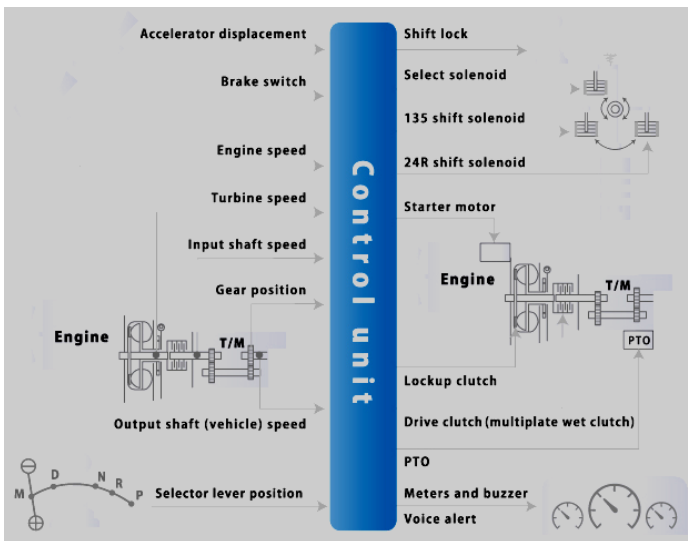
An automatic gear-box DSG (Pictures 1) is frequently used. There is a three-shaft transmission with six speed gears. Two gear-boxes situated in parallel are used in DSG. DSG gear-box includes two clutches: first clutch is for shifting 1, 3, 5, reverse gear, second clutch is for shifting 2, 4, 6 gear. It follows: two speed gears are inserted at the same moment, but only one clutch is clamping together. At the moment of gear change first clutch unclasps and second clamps. By information from sensors: the next speed gear is inserted (above or down) and is ready for the moment of shifting, but the first clutch remains unclamped. Only the corresponding clamp is unclamped or clamped at the moment of shifting. Because of it, the gear shifting is very short and performed for a tenth of a second. In regard of number of input information (revolution of engine, output revolution of gear-box, etc.) there is possibility to set optimal revolution of engine relevant to revolutions of tires to achieve as much flowing shifting (comfort for passengers, safety of vehicle motion, etc).



**Picture 1. DSG automatic gear-box principle**

([https://www.vutbr.cz/www\\_base/zav\\_prace\\_soubor\\_verejne.php?file\\_id=175182](https://www.vutbr.cz/www_base/zav_prace_soubor_verejne.php?file_id=175182))

A control unit is necessary for automatic control – a system controlled by an intern program. A program is performed in real time by processing a number of input signals as information needed for adequate shifting of speed gear at corresponding moment. On the basis of input information, algorithms and computing, control units exploit electric or hydraulic outputs to perform control interventions. Output parts of electronic control of automatic gear-box are actuators that transform the output signal of control unit into mechanic actions – to shift adequate speed gear.



**Picture 2. Inputs and outputs of DSG automatic gear-box (an example)**

(<https://www.transtron.com/en/products/control/autogears.html>)

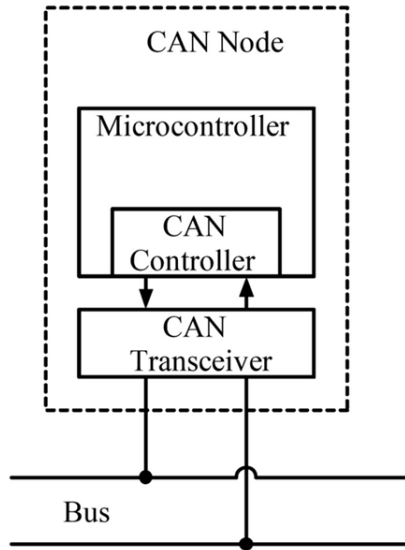
Number and amount of wires is increasing in regard to the big number of sensors situated on different places of the vehicle. This is the reason for: weight of vehicles increasing, necessity for bigger amounts of materials, increasing number of probable failure points, demands to colour marking, lucidity in system, etc. Possibility to verify error-free function of separate sensors and system as a unit is absent – needed diagnostics of a system. Control unit is based on microcontrollers to have the ability to evaluate big quantities of data and to make it possible to change algorithms of automatic gear-box operation. This was the reason why the problem of separate parts connection as a compact unit has been solved. Number of systems, not only automatic gear-boxes, are into modern vehicles. The electronics of modern vehicles consist of a system of electronic control units. Each unit controls a separate part of the vehicle. An action of each unit is determined by its intern program. The purpose of dividing electronics of vehicles into separate units was to save data. Separate units are possible to be placed around a system that is controlled by them. Control units communicate by data net. Whole data net of the vehicle is separated into a number of data nets. Data nets connect units that cooperate – they use data from the same sensors for example. If there is a need to communicate between data buses, communication is realized by a gateway that is usually situated in the central control unit. CAN – Controller Area Network is mostly used as a data network in vehicles at present time.

### **CAN – Controller Area Network**

The CAN is a serial communication protocol. CAN enables a high level of data transfer security. It forms distributed real-time control. Not only CAN networks are known and used. CAN converters are used to realise communication interfaces. Data conversion can be between CAN and RS-232, RS-485, Wi-Fi, USB or Ethernet. Because of it, CAN bus is suitable for:

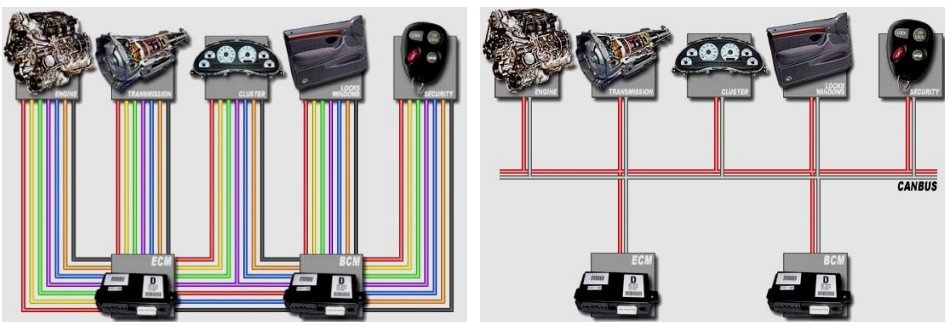
- Car control
- Aircraft control
- Marine control
- Car industry
- Factory automation
- Medical systems.

The CAN principle is – when the bus is free any unit may start to transmit a message. The message of highest priority is prioritized. It can improve the network reliability and transmission efficiency. CAN enables networking of devices as well as sensors and actuators. Error detection is implemented in each CAN node. Safety of data transfer is important.



**Picture 3. The CAN bus node principle** ([https://en.wikipedia.org/wiki/CAN\\_bus](https://en.wikipedia.org/wiki/CAN_bus))

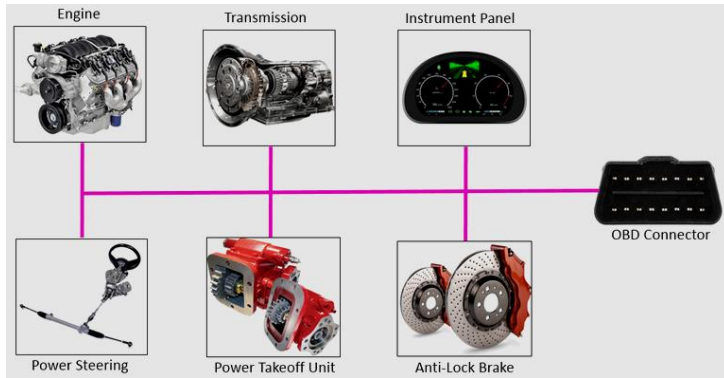
If two or more nodes start transmitting messages at the same time, only one of them can be sent successfully according to the priority. CAN bus makes possible communication to separate units by two wires net with data speed to 1Mbps in dependence on distance. CAN bus changes complex architecture of communication, from multiple-wire system to essentially simpler two wire system (Picture 4).



**Picture 4. Comparison of wire net – multiple-wire and CAN bus**

(<https://www.lacneautoarmy.sk/recenzie-a-clanky/slovnik-pojmov/co-je-to-canbus.html>)

The mentioned express necessity to change the concept of vehicle as an entity. Separate units are not possible to sense separately, but as parts connected reciprocally, able to communicate and to cooperate (Picture 5).



**Picture 5. Principle of data net creation in modern vehicle**  
 ([https://tauvicr.files.wordpress.com/2019/07/canbus\\_network.png](https://tauvicr.files.wordpress.com/2019/07/canbus_network.png))

A vehicle as well as other plants that use CAN bus is needed to sense as a system of interacted components. There is need to prepare people at production process, service, as well as users of systems for this type of reflection. Plant loses primarily sensed character, it changes into complex units that associate numbers of specialists to design suitable unit. Amount, contents, safety of transportation, processing and exploitation of data came to be dominant in term of functionality and quality of exploitation of plants with different purpose of using. There will not be possibility to compete in competition and to ensure suitable improvement of society without adequate educational preparation.

## Conclusion

The article describes, by example, automatic gear-box, changes that occur in principle of function of different goods. It calls attention to the obligation of a new approach to the content of education that is essential to retain the needful improvement of society.

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